REMARKS

Applicant has carefully studied the outstanding Office Action. The present response is intended to be fully responsive to all points of rejection raised by the Examiner and is believed to place the application in condition for allowance. Favorable reconsideration and allowance of the application is respectfully requested

Claim Objections and Claim Rejections

The Examiner objected to claim 1 under 35 U.S.C § 112, second paragraph, as being indefinite because of the limitation "by means of the remote terminal", since there is no antecedent basis for "the remote terminal".

In response, Applicant has amended claim 1 so that the claimed method corresponds to the described, computer-implemented method in a local system. Thus, amended claim 1 recites the step of "in response to a selection, by a user of the terminal, of an area of the navigation map, transferring corresponding high resolution data..."

The method recited in amended claim 1 involves acquiring high power/resolution image data by scanning or imaging the specimen using a high power objective lens, to obtain a high resolution, magnified image of the complete specimen. A low resolution copy of the high resolution image data for the complete specimen is obtained by digitally processing the high resolution image data. Both the high resolution and low resolution image data is stored in a database.

The method also comprises allowing access to the image data in a telemicroscopy process. In response to a request by a user of a terminal, which may be remote from the local system where the data is acquired and stored, the low resolution image data will be transferred from the database to the terminal for display as a "navigation map" as described in the application. The user can select an area of the complete specimen, using the navigation map, for viewing at high magnification/resolution. In response to a selection of an area of the navigation map, the claimed method transfers the high magnification/resolution image data, for the selected area, to the terminal, for viewing by the user.

Claim Rejections Under 35 U.S.C. § 103(a)

The Examiner has rejected claims 1, 2, 4 and 5 under 35 U.S.C. § 103(a) as being unpatentable over Jansson (U.S. Patent No 4,673,988) in view of DeAguiar (U.S. Patent No. 5,263,136). Additionally, the Examiner has rejected claims 6 and 7 under 35 U.S.C. § 103(a) as being unpatentable over Jansson and DeAguiar in view of Finarov (U.S. Patent No 5,604,344). Still additionally, the Examiner rejected claims 3, 8 and 9 under 35 U.S.C. § 103(a) as being unpatentable over Jansson and DeAguiar in view of Mochizuki (U.S. Patent No. 5,825,532).

Before discussing the amendments and references cited by the Examiner, Applicant would like to briefly set out the background to the present invention.

In any telemicroscopy system such as the present invention, three types of software must be employed.

1. Scanning software – to control the imaging equipment, and to process (i.e. mosaic) and store the image data;

2. Server software – to retrieve and provide image data in response to client requests, and

3. Client software – to send requests for image data to the server, and to receive and display the images to a user (e.g. a pathologist at a remote location).

In considering the most efficient technique for providing a telemicroscopy system and method, the Applicant took a quite different direction from others, including those disclosed in the prior art documents relied on by the Examiner.

Firstly, in relation to the "scanning software", unlike the technique disclosed in *Jansson*, the Applicant recognized that a *single scan* of the complete specimen at *high magnification/resolution* was practical.

Conventional belief, up to the time of the invention, was that a scan of the complete specimen at high magnification/resolution was impractical (in terms of scanning time, processing requirements and memory consumption by the resulting image data). Thus in

Jansson, and also Bacus (US 6,522,774 and related patents), only a selected part of the specimen is scanned at high magnification/resolution.

In addition, a single scan at high magnification/resolution provides all the image data necessary for use in telemicroscopy. In particular, a low magnification/resolution image of the complete specimen must be provided to the remote pathologist, to give him an overview of the specimen. The Applicant realized that this low-resolution image or "navigation map", which is relatively small in data size, can be generated from the mosaiced high magnification/resolution image data. The prior art, such as Jansson or Bacus, obtains the navigation map by performing a low magnification/resolution scan of the specimen, in addition to the high resolution/resolution scan of a selected area of the specimen. Thus, these prior art techniques utilize two separate scans.

A third advantage to scanning the complete specimen at high magnification/resolution is that the system is able to provide high magnification images for every portion of the specimen. This is discussed further below.

In relation to the client-server software, Applicant realized that it was not practical to send the remote user the high-resolution image data for the complete specimen. This would be time consuming, and therefore inconvenient to the user, in view of the large quantity of data involved. Thus, Applicant decided to allow the remote user, with the client software, to select, from the navigation map, an area of interest for viewing at high magnification/resolution. Only the high magnification/resolution image data for the selected area is transferred by the server in response to such a selection, so that there is no undue delay in the transfer of the images to the pathologist. However, the pathologist is free to make successive selections at any location on the navigation map, since high magnification/resolution image data has been acquired for the complete specimen. In other words, the pathologist has no constraints as to the area of the specimen which can be viewed at high magnification/resolution. The pathologist thus has exactly the same freedom to view the specimen as in a pathology laboratory.

In contrast, techniques such as that used in Jansson or Bacus, require the local operator to select the area of the specimen for imaging at high magnification/resolution. Only the part or parts of the specimen selected by the local operator are imaged at high

magnification/resolution. This restricts the ability for the remotely located pathologist to view areas of interest at high magnification/resolution.

Applicant submits that Jansson does not disclose or suggest imaging a complete specimen using a high power objective lens to obtain data for a composite high resolution, magnified image of the complete specimen. Furthermore, Applicant submits that Jansson does not disclose or suggest digitally processing high magnification/resolution image data to obtain a low resolution copy of the composite image of the complete specimen for use as a navigation map in a telemicroscopy method.

Jansson teaches the acquisition of a low magnification (using a 1X objective lens), low resolution live video image of a specimen for use as a navigation map (column 5, lines 5-15). From this low magnification/resolution navigation map, the operator selects a desired section of the specimen for imaging at a high magnification (using a selected, high power objective lens), using a rectangular mosaic image marker (MIM) (column 5, lines 11-12, 15-17 & 22-25). The stage coordinates for the starting and finishing positions of the selected area are computed, and then high magnification field of view images (vignettes) of the selected area are captured by moving the stage in a serpentine path between the starting and finishing positions. The high magnification images are then mosaiced together and stored, for subsequent viewing.

Thus, Jansson only images a selected portion of the specimen at high magnification/resolution. Consequently, Jansson suffers from the disadvantage that only a small area of the specimen is available for viewing by a user at high magnification. If a remote user, such as a specialist pathologist at a remote location, wishes to view an area of the specimen on the navigation map that is not within the area selected from scanning by the operator, who performed the scanning, such as a local pathologist, the remote user would be unable to do so immediately – the local pathologist would have to perform another, separate scan. In contrast, the method of the present invention acquires images of the complete specimen at high magnification/resolution, thus providing a remote user with absolute freedom to select areas of interest for viewing in detail (i.e. at high magnification) from the navigation map.

In addition, Jansson performs two separate scans of the specimen, with two different objective lenses. The first scan images the complete specimen at low (1X) magnification to

produce a navigation map, and the second scan images only a selected portion of the specimen at high magnification. In contrast, the present invention performs only a single scan of the complete specimen at high magnification. A navigation map is generated from the high magnification image data by digital processing – a second scan, using a low power objective lens, is therefore not required. Thus, the claimed method is more convenient to the local user, who can select the high power objective lens, and leave the system to automatically perform the scan, without further intervention. Jansson requires the local user to change microscope lenses and select an area of the specimen, which is inconvenient and time consuming to the operator.

There is no disclosure or suggestion in the secondary references of the underlying principles of the present invention, which would lead the skilled person to modify the teaching of Jansson in order to arrive at the claimed invention. In particular, none of the prior art documents appreciate that only a single scan of the complete specimen, using a high power objective lens, is necessary to obtain all the image data required for a telemicroscopy method. Specifically, none of the prior art documents teach that a low resolution navigation map (equivalent to low magnification image data) can be digitally generated from the high magnification/resolution image data acquired from a single, high magnification scan of the complete specimen. The quantity of the low resolution image data for the complete specimen is sufficiently small such that it can be transferred to a remote location quickly using conventional network bandwidths. The remote user can then select areas of the navigation map for viewing at high magnification/resolution. Only the selected portions of the high resolution image data need to be transferred, in response to requests for high resolution images of selected areas, so that, again, the quantity of data transferred is manageable.

DeAguiar, referred to by the Examiner, is concerned with a problem not arising in the present invention, namely memory management in a system that stores images, that has insufficient fast main memory storage capacity for large images (of the order of hundreds of Megabytes). As explained at column 1, lines 17-43 of DeAguiar, such images were, at that time, stored in relatively slow, secondary memory such as on disk, in view of the cost of fast, RAM memory at the time. This problem was not an issue at the date of the present invention in view of advances in memory technology and reductions in the cost thereof. DeAguiar takes a large digital image, and segments it into rectangular "tiles" for the purposes of image processing. Memory management is performed in relation to these tiles, independently of

each other, in a virtual memory management system. The image data for each tile may be compressed, or the resolution reduced, for the purpose of reducing the quantity of data stored in the limited memory space of the fast memory (see column 6, lines 22-60).

DeAguiar, does not provide any motivation for reducing the resolution of image data for a composite, high resolution image to provide a navigation map for use in selecting areas for viewing at high resolution. Rather, DeAguiar is concerned with providing a user with fast, real time access to small areas or "sub images" of a larger overall image, comprising one or a few image tiles, from memory for viewing, panning and zooming the sub-image. This is achieved by storing each image tile at several different resolutions. Thus, there is no reason to combine the teachings of DeAguiar and Jansson, since Jansson already provides a low resolution composite image, for use as a navigation map, by performing a low magnification scan. Moreover, at the time of the present invention, there would be no reason to utilize the memory-saving techniques taught in DeAguiar in the method of Jansson, in view of the availability of low cost high speed semiconductor memory.

While DeAguiar does disclose transferring a low resolution sub-image to a user (column 18, lines 39-41, step 544 in Figure 15) this is not in the context of providing an image map, showing the full image, for making a selection therefrom. The user loads sub-images for processing from a "source image file" (column 7, lines 14-15) or creates them (column 7, lines 15-17). There is no disclosure of the selection of sub-images from a navigation map providing a full, low resolution image. The transfer of different resolution sub-images in DeAguiar (column 7, lines 25-33) relates to the transfer of the same image (which is a part of a larger image) at different resolutions, and not to the selection of a sub-image for viewing at high resolution from a full image at low resolution.

Thus, claim 1 cannot be rendered obvious in view of Jansson and DeAguiar.

Apparatus claim 5 has been amended to recite apparatus features corresponding to the method steps of claim 1. Accordingly, Applicant submits that the telemicroscopy apparatus of claim 5 cannot be rendered obvious in view of Jansson and DeAguiar, for similar reasons to those set out above.

New claim 10 has been introduced and is directed to a method for acquiring image data for use in the method of telemicroscopy of claim 1. Claim 10 recites the steps of

imaging a prepared specimen using a high power objective lens to obtain high resolution digital image data of the whole specimen, and digitally processing the high resolution digital image data to obtain a relatively low resolution copy of the image data of the specimen. Claim 10 therefore includes the feature of claim 1 that the low resolution image of the complete specimen, which is used as a navigation map, is obtained by digitally processing high magnification/resolution image data of the whole specimen obtained by a high magnification/resolution scan. For the reasons set out above, these steps are not obvious in view of the disclosures of Jansson and DeAguiar.

New claim 19 has been introduced and recites apparatus features corresponding to the method steps of claim 10. Accordingly, Applicant submits that the telemicroscopy apparatus of claim 19 cannot be rendered obvious in view of Jansson and DeAguiar, for similar reasons to those set out above.

New claim 24 recites the process described above of high power imaging of the entire specimen and digitally processing the image to produce the low resolution copy.

New claim 25 sets forth an apparatus to image a specimen at high power and a processor for producing a low resolution copy therefrom.

For the reasons set forth above, the new claims and their respective dependent claims are likewise believed to be allowable.

Conclusion

Applicant believes therefore that the invention is fully distinguished over the art of record because:

a) the complete specimen is imaged to obtain high resolution image data;
b) the high resolution image data is digitally processed to obtain the low resolution copy of the image data, and
c) this low-resolution copy of the image data is transferred to a terminal, for use as a navigation map by a user of the terminal, in order to select an area of the image for viewing at high resolution.

The cited references do not show or suggest these features alone or in combination.

Applicant submits, therefore, that claims 1-25 are patentable over the prior art references cited by the Examiner.

In view of the foregoing, it is respectfully requested that the Examiner reconsider his rejection of the claims, the allowance of which is earnestly solicited

Respectfully submitted,

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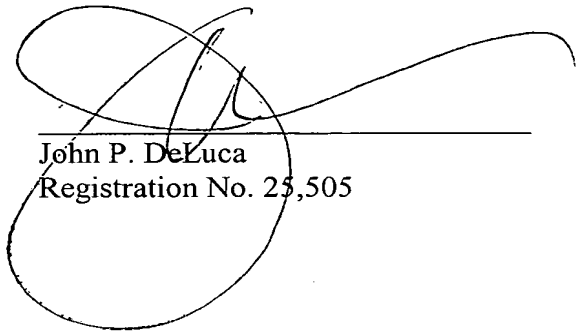

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